M.R.P. 1066
S.C.11/243
27th August, 1957

Average height of the standard isobaric surfaces over the temperate and tropical regions in July.

by

H. Heastie

(Meteorological Office)

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AIR MINISTRY

METEOROLOGICAL RESEARCH COMMITTEE

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1. Introduction

This paper is a further step in the revision of Geophysical Memoir 85 - Upper Winds over the World. In a previous paper (1) the contours of the standard isobaric surfaces were mapped, on a Mercator projection, over the area from 75°N. to 60°S. for the month of January. The present paper shows similar charts for the month of July. The contour charts prepared in the course of the revision of this memoir are being presented as they are drawn for each month, with the object of making them quickly available to users, so avoiding the inevitable delay in publication.

2. The data

Data for the same period 1949-53 were used - the sources are listed in the previous paper (1). Whenever available, data from ascents made in darkness were used; no attempt was made to apply radiation corrections systematically to those data derived from daylight ascents, except in two cases for which corrections were readily available. The South African data were corrected in the light of a paper by Henry (2) as explained in the previous paper (1), and radiation and lag corrections, evaluated in the Upper Air Climatology Branch of the Meteorological Office, were applied to the data from overseas stations using the British radio-sonde. These corrections were based on a paper by Scrase (3). In addition a further correction was made to the 100 mb data from Nairobi and Bahrain where the temperature was below -90°F. (see ref. (1) para. 2). Wind data for British overseas stations and Hong Kong were again used. The period of these data was 1948-53 in general, though shorter periods only were available for some stations. All available data, irrespective of period, from Argentine Islands, Mawson and Terre Adélie in Antarctica were consulted as a guide to the drawing of the charts at the southern boundary. Stations for which data were available are shown in fig. 1, though in some cases data for individual years were missing.

3. Method of constructing the charts

The method of constructing the charts was almost the same as that described in the previous paper (1). Two minor differences may be mentioned here. For July, charts of average temperature were drawn for all levels from 700 mb to 100 mb, whereas for January the 700 mb and 500 mb temperature

/charts

charts were omitted. This procedure enables a slightly greater degree of consistency to be maintained between the contours at different levels and the full set of temperature charts is useful for the drawing of meridional cross-sections which it is proposed to include in the memoir at a later stage. For the January charts no "correction for tropopause" was applied in respect of the tropical tropopause. In July, however, this tropopause lies below the 100 mb surface over large areas of the chart. Moreover there is frequently a large temperature inversion just above it. Since the method of construction of the 150-100 mb thickness chart involves the calculation of the thickness from the temperature at 150 and 100 mb some correction had to be made for the presence of this tropopause. For each station the difference between the heights of the 100 mb and 150 mb surfaces was evaluated directly and the thickness of the 150-100 mb layer at a temperature equal to the mean of the 150 and 100 mb temperatures was calculated. The differences between these two thicknesses were plotted on a chart and isopleths drawn with the aid of a chart of tropopause pressure (4). Grid values of this parameter were then read off and interpolated as a "correction for tropopause" for places where direct data were not available.

4. The charts

It should be noted that, on the contour charts, the isopleth interval is 100 geopotential metres while, on the thickness charts, the interval is 50 geopotential metres. North of 55°N. the charts are merely the redrawing of the circumpolar charts on the Mercator projections, apart from some very minor amendments along the 55°N. parallel.

The seasonal contrast between summer and winter is much more marked in the northern than in the southern hemisphere. The very strong wind belts of the northern hemisphere which are such a feature of the upper troposphere in January have disappeared in July except over the eastern Mediterranean and northern United States where they appear with wind speeds much reduced. A belt of high contour height extends round the hemisphere at about 25-30°N. except over India and southern China in the lower levels where the monsoonal surface low is reflected by troughs in the 700 mb and 500 mb contours. At high levels this belt which is most marked over the Eurasian land mass leads to an easterly flow pattern over a large area south of about 25°N. in eastern longitudes. This area is too near the equator for the geostrophic relation to be used and no details of the flow can be deduced from the contours. The average wind at 100 mb at Aden is 090° 64 kt.

In the extratropical regions of the southern hemisphere there is mainly westerly flow with little meridional motion. This flow is generally stronger and extends further northward in July than in January. It seems probable that, in July, there are two strong wind belts corresponding to the temperate latitude and sub-tropical jet streams, but it is not possible to give details without drawing meridional cross-sections and isotach charts. The main trough which in January lies at about 40°E. appears at about 80°-90°E. in July.

References

(1) Heastie, H. Average height of the standard isobaric surfaces over the temperate and tropical regions in January. Meteorological Research Papers, Air Ministry, London, No. 1045, 1957.

(2) Henry, T. J. G. A comparison of mean temperatures obtained with Canadian and American types of radio-sonde. Department of Transport, Meteorological Division, Toronto, Circular 2041, 1951.

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(3) Scrase, F. J. Application of radiation and lag corrections to temperatures measured with the Meteorological Office radio-sonde. Met. Mag., London, 85, 1956, p.65.

(4) Goldie, N., Moore, J. G. and Austin, E. E. Upper air temperatures over the world. Geophys. Mem. No. 101, London (in the press).

MRPRM

JULY 1949–53

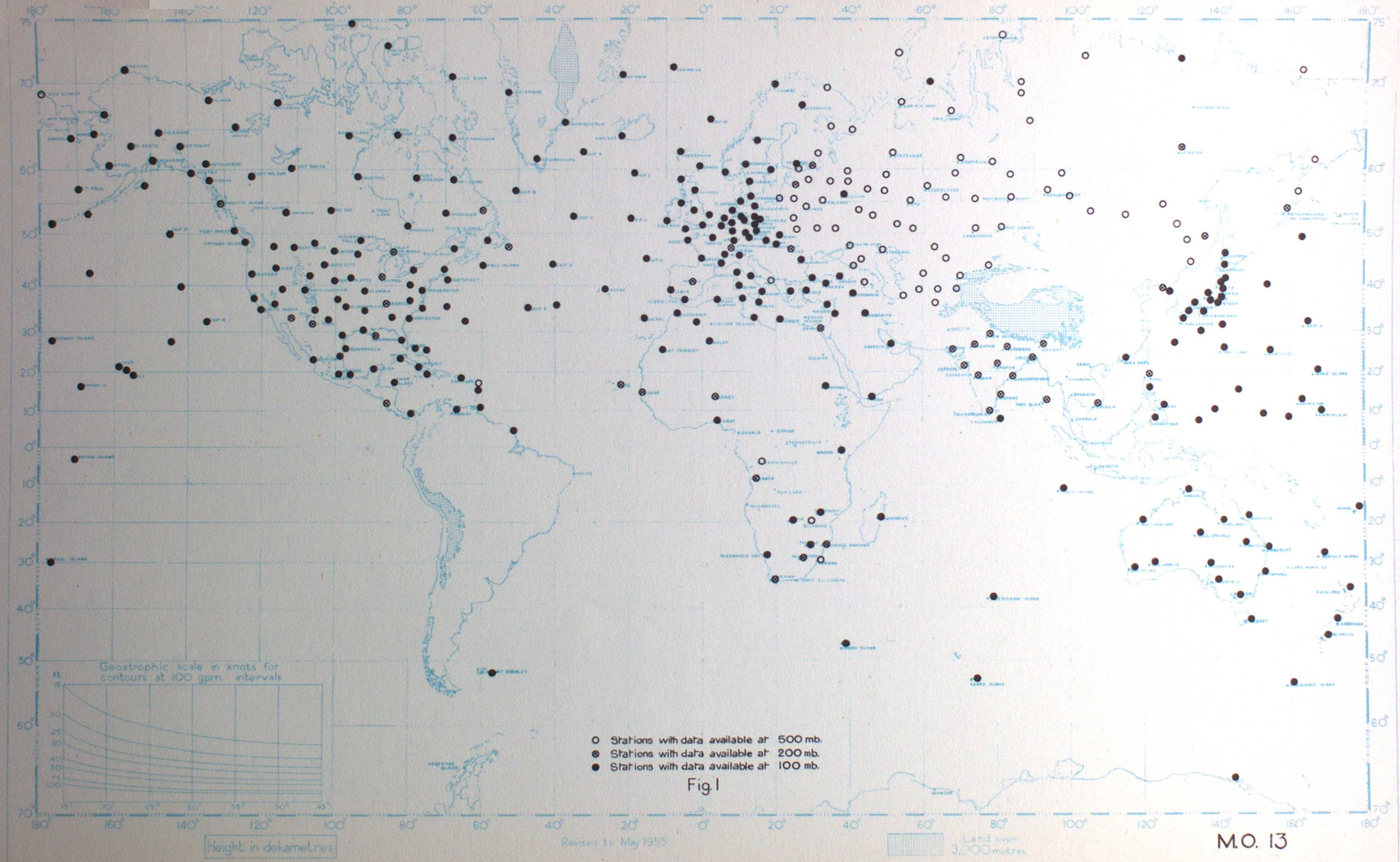

Fig. 1

M.O. 13

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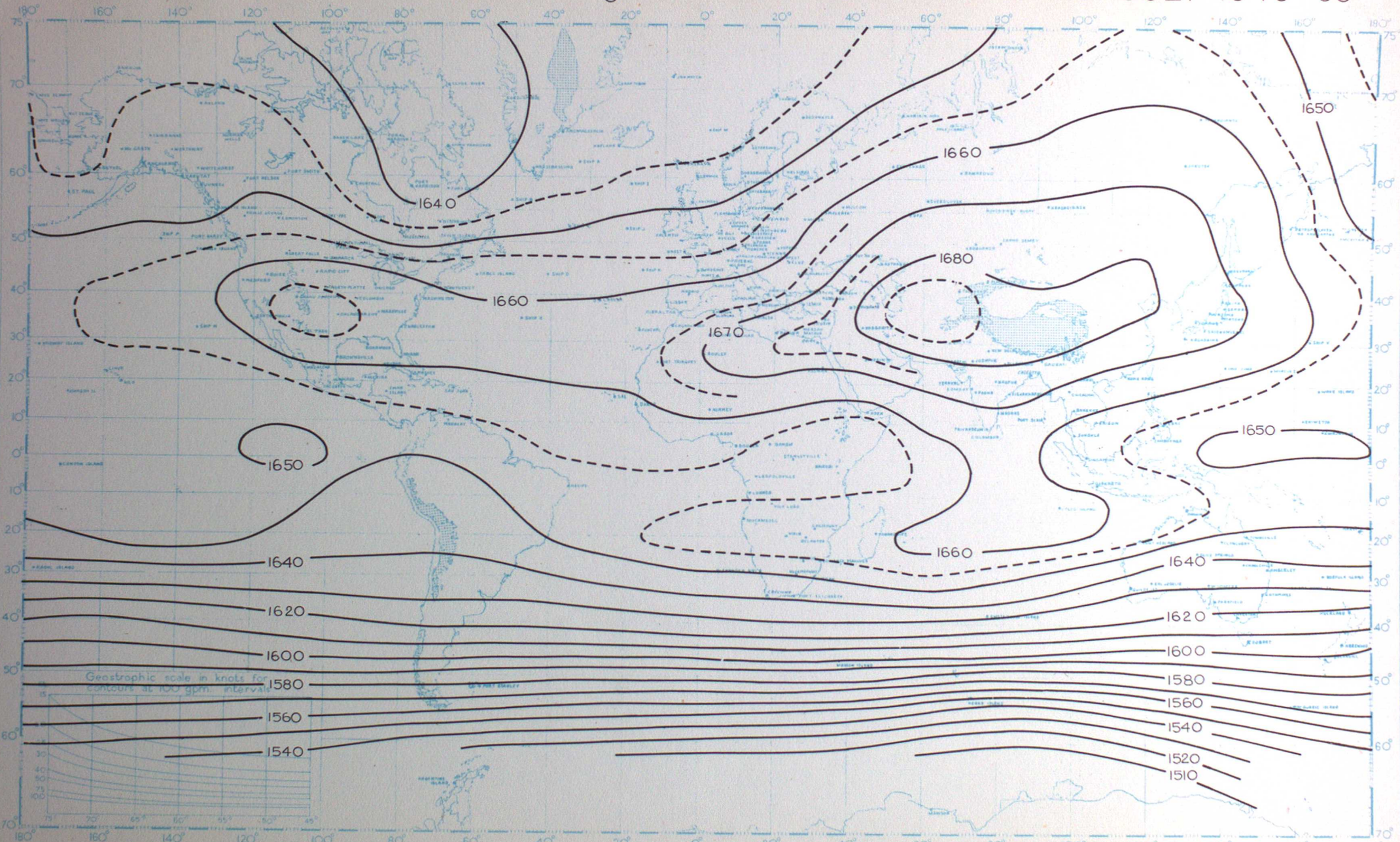
Average 100 mb. Contour

JULY 1949-53

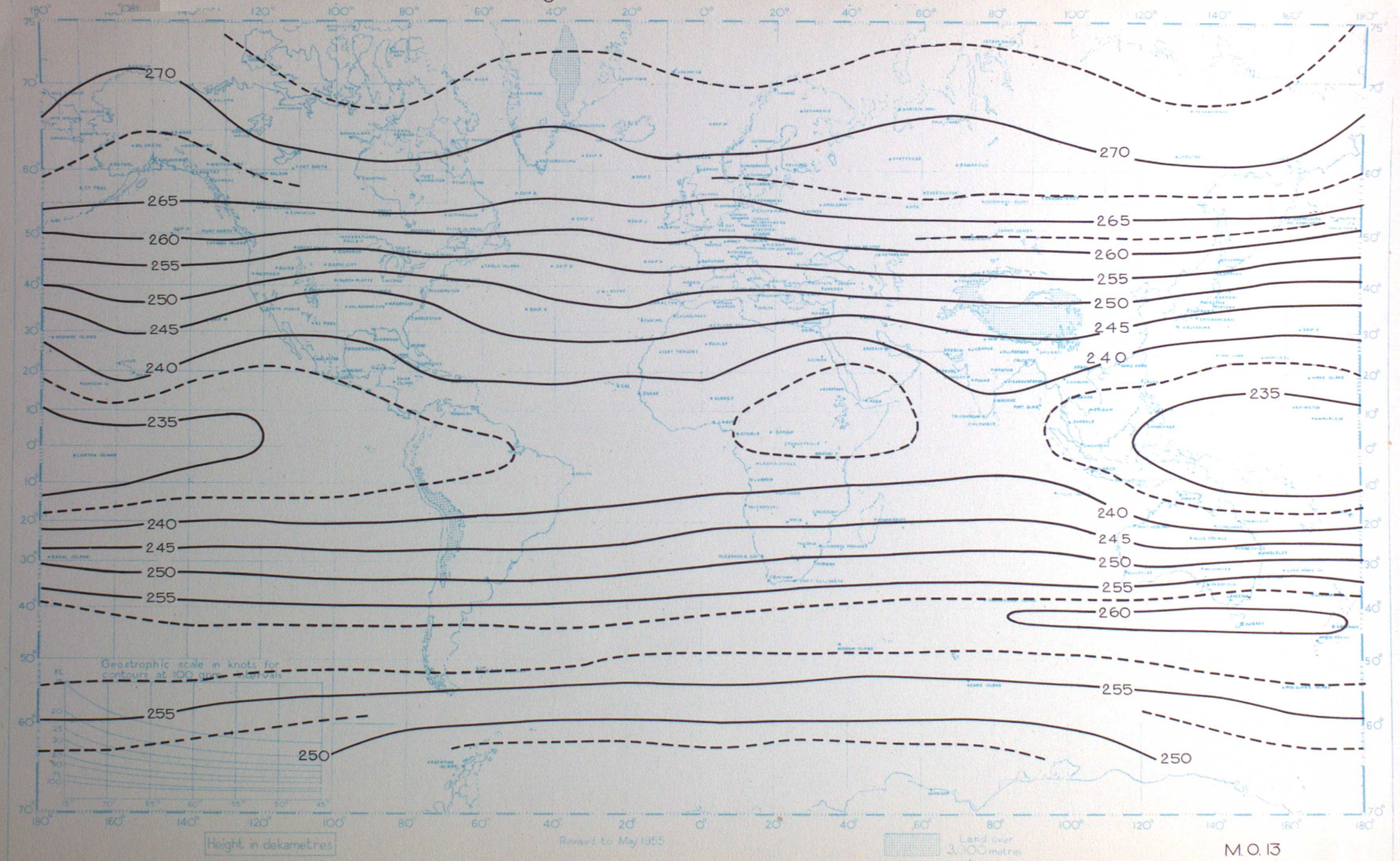


M.O. 13

M.R.P. 1981

Average 150–100 mb. Thickness

JULY 1949–53

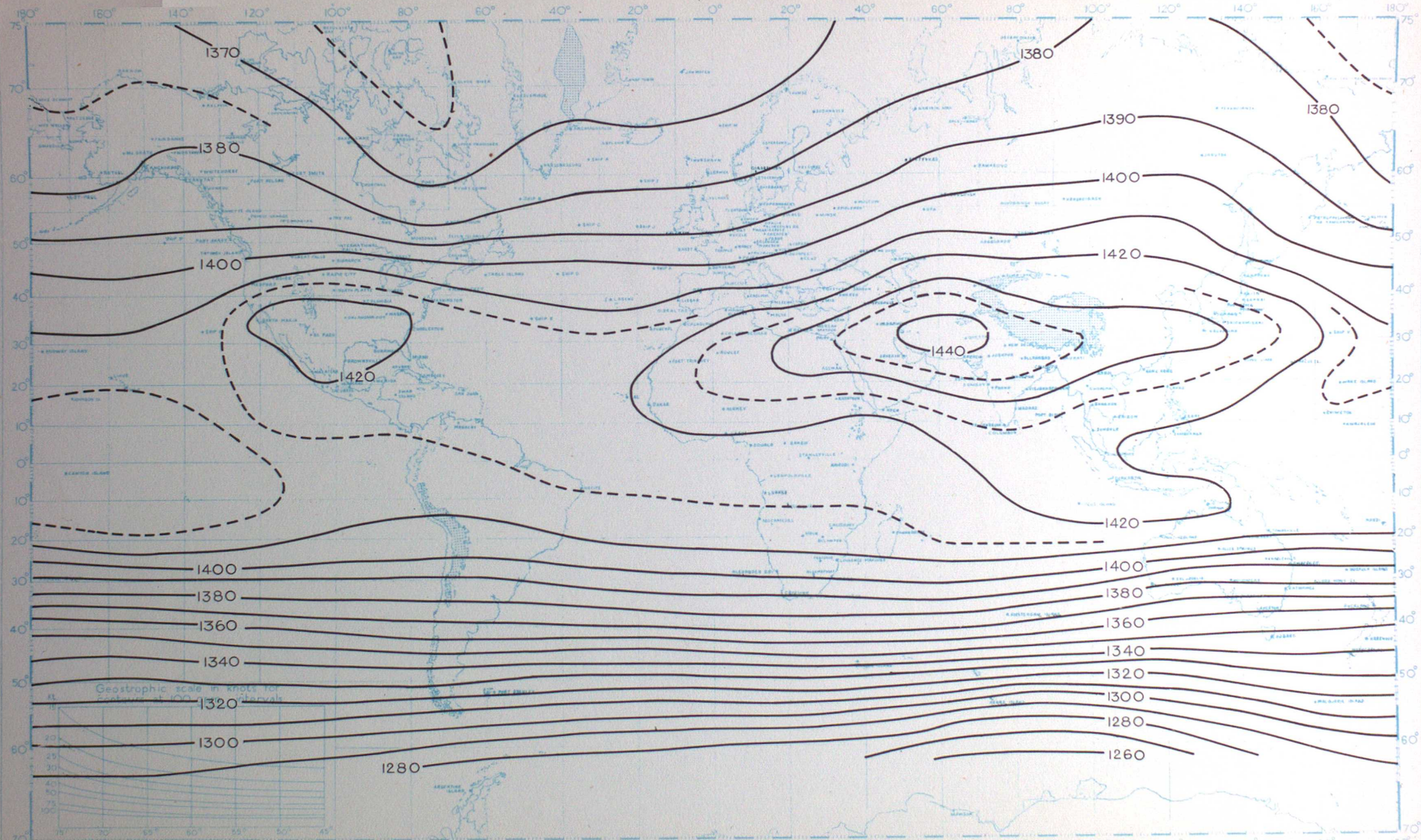


M.O. 13

MRP1199M

Average 150 mb. Contour

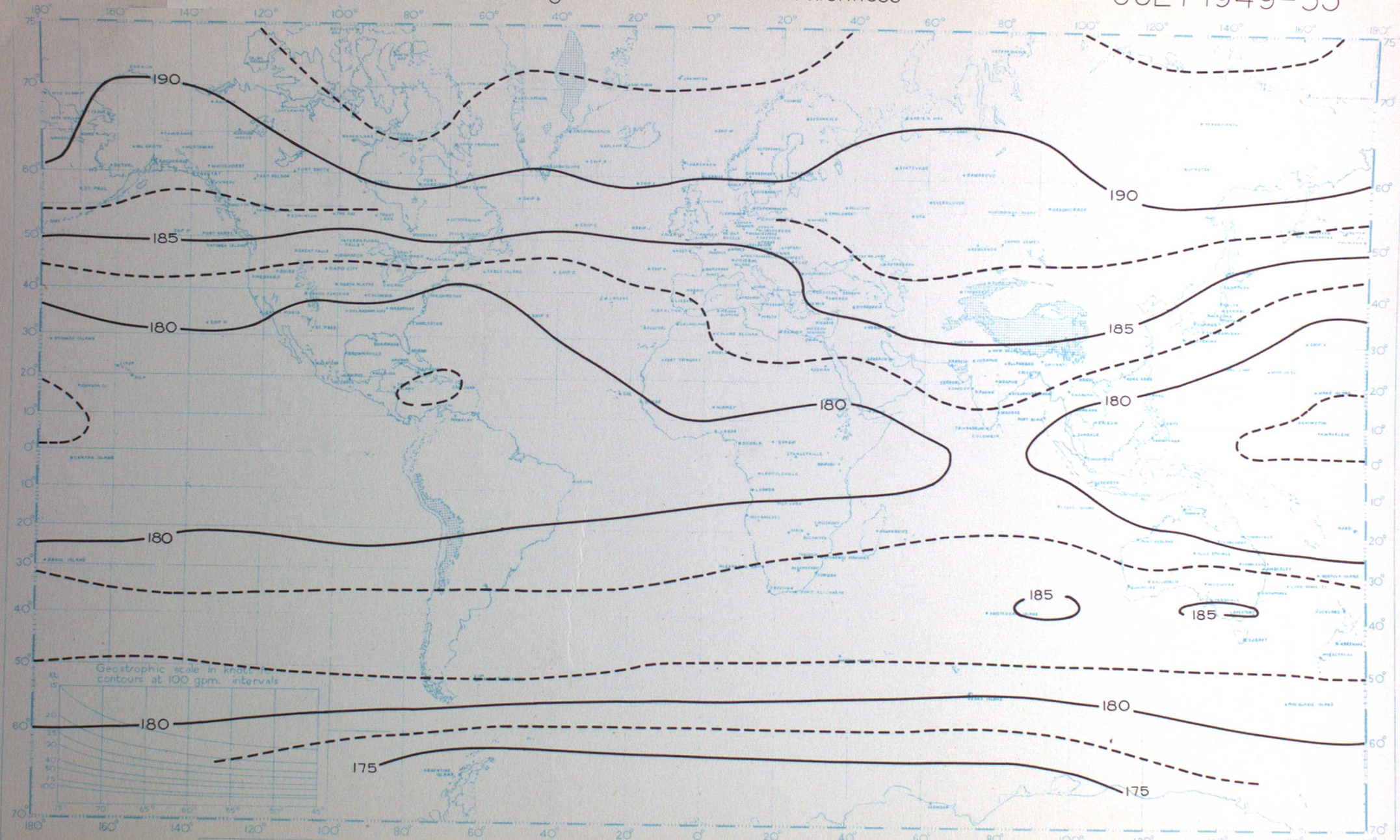
JULY 1949 - 53



M.R.P. 9R.M

Average 200-150 mb. Thickness

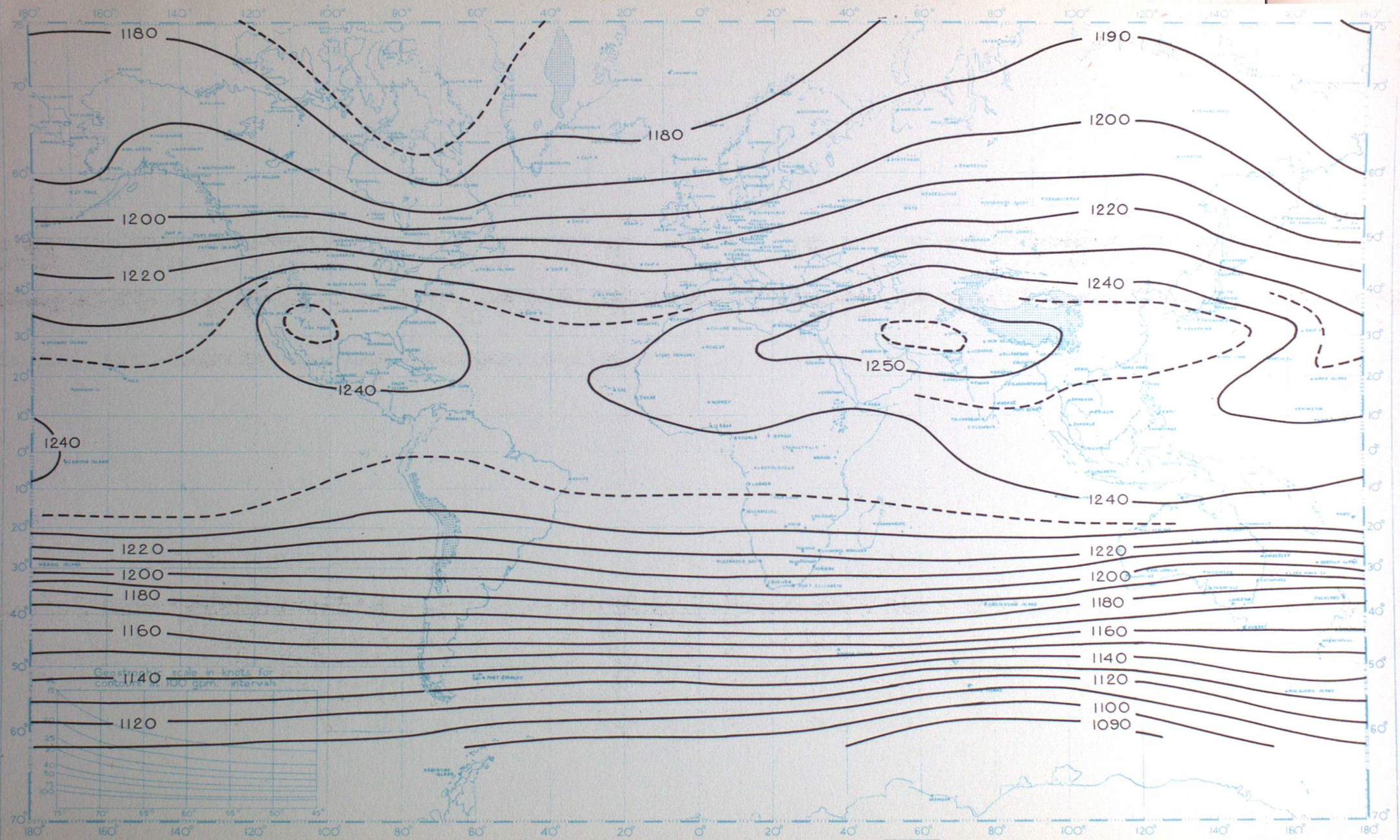
JULY 1949-53



M.O.13

M.R.P.1066

Average 200 mb. Contour

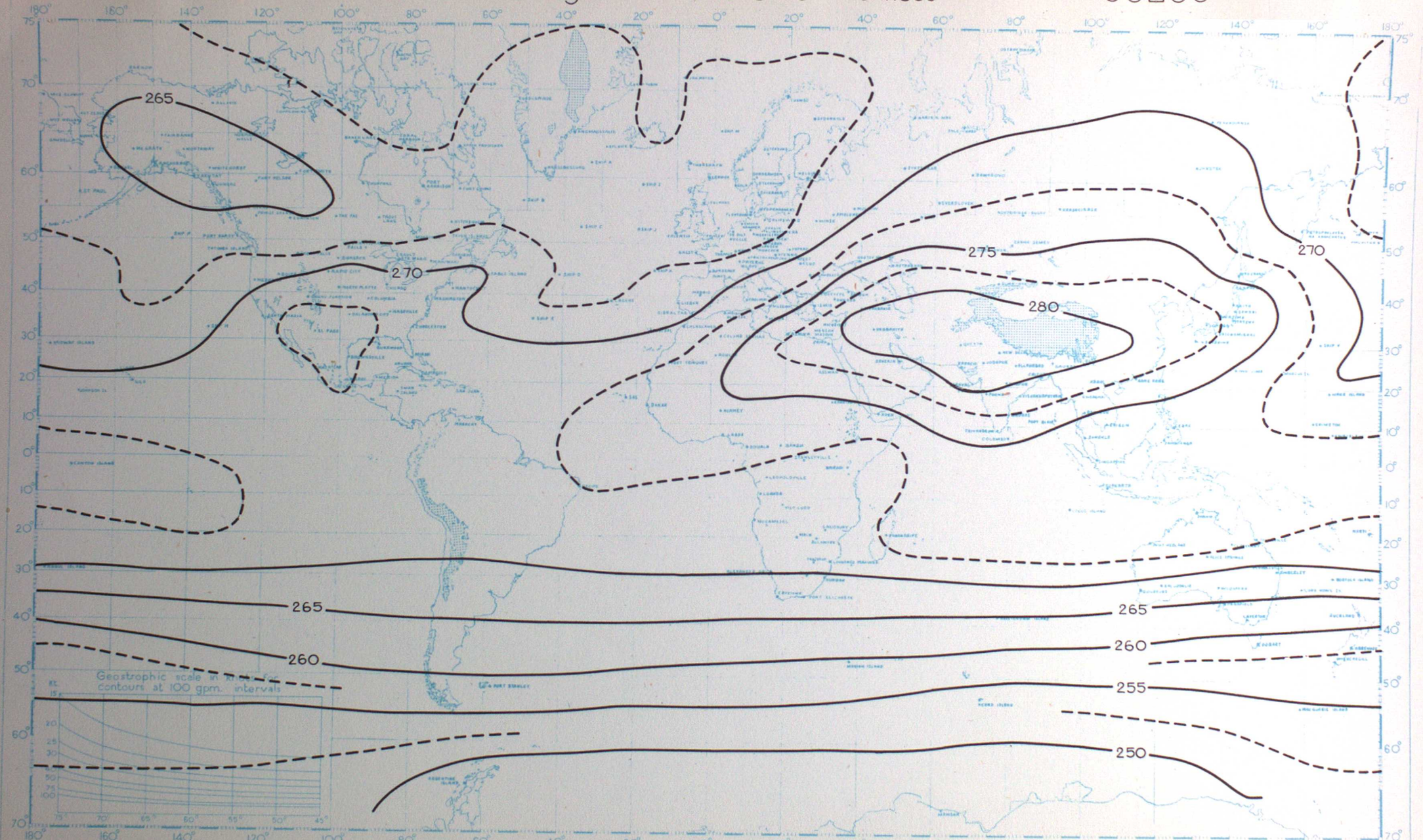


M.O.13

M.R.P 1066

Average 300–200 mb. Thickness

JULY

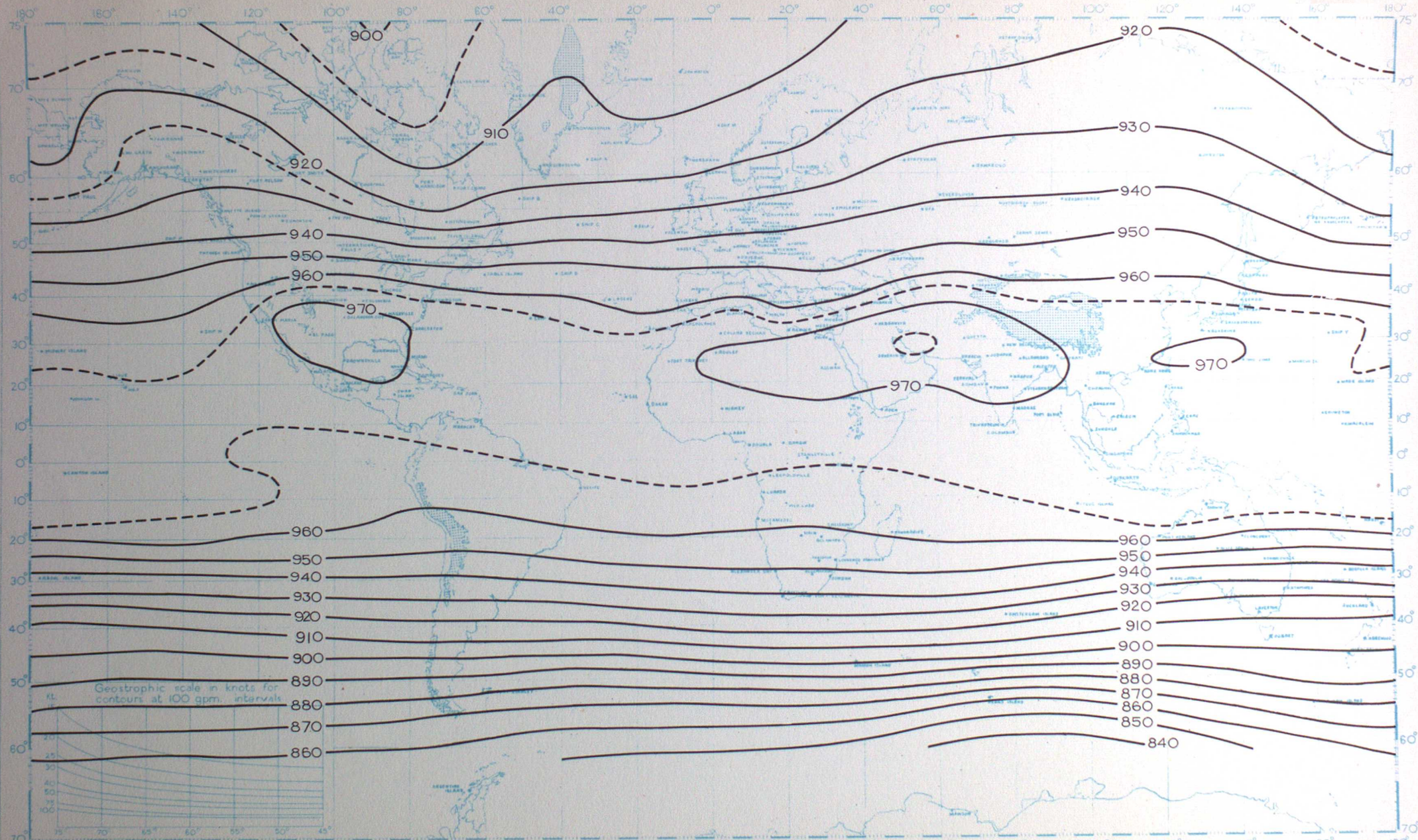


M.O.13

M.R.P.1066

Average 300 mb. Contour

JULY



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M. O. 13

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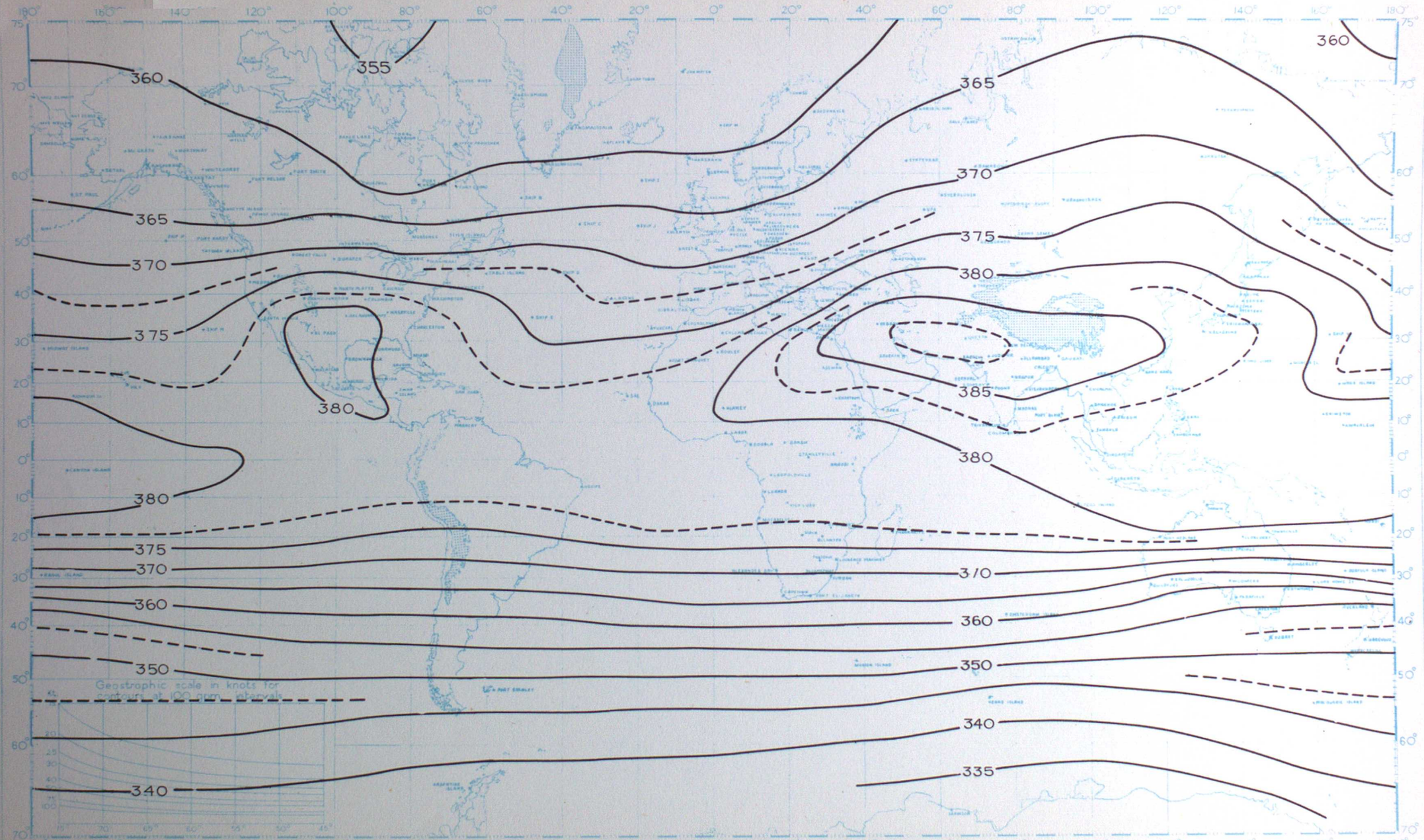
Average 500–300 mb. Thickness

JULY 1949–53



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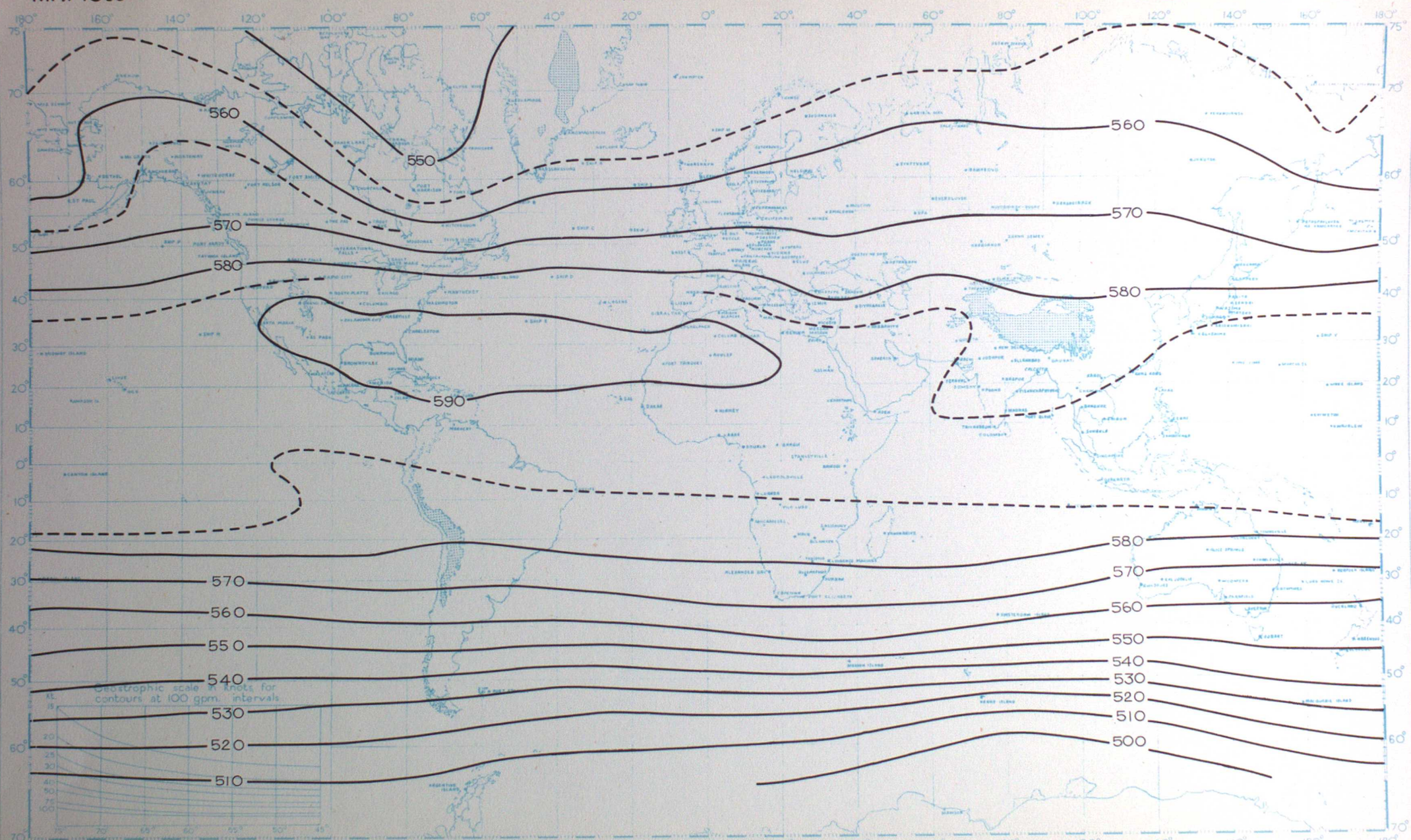
M.R.P.1066

Average 500mb. Contour

JULY 1949-53

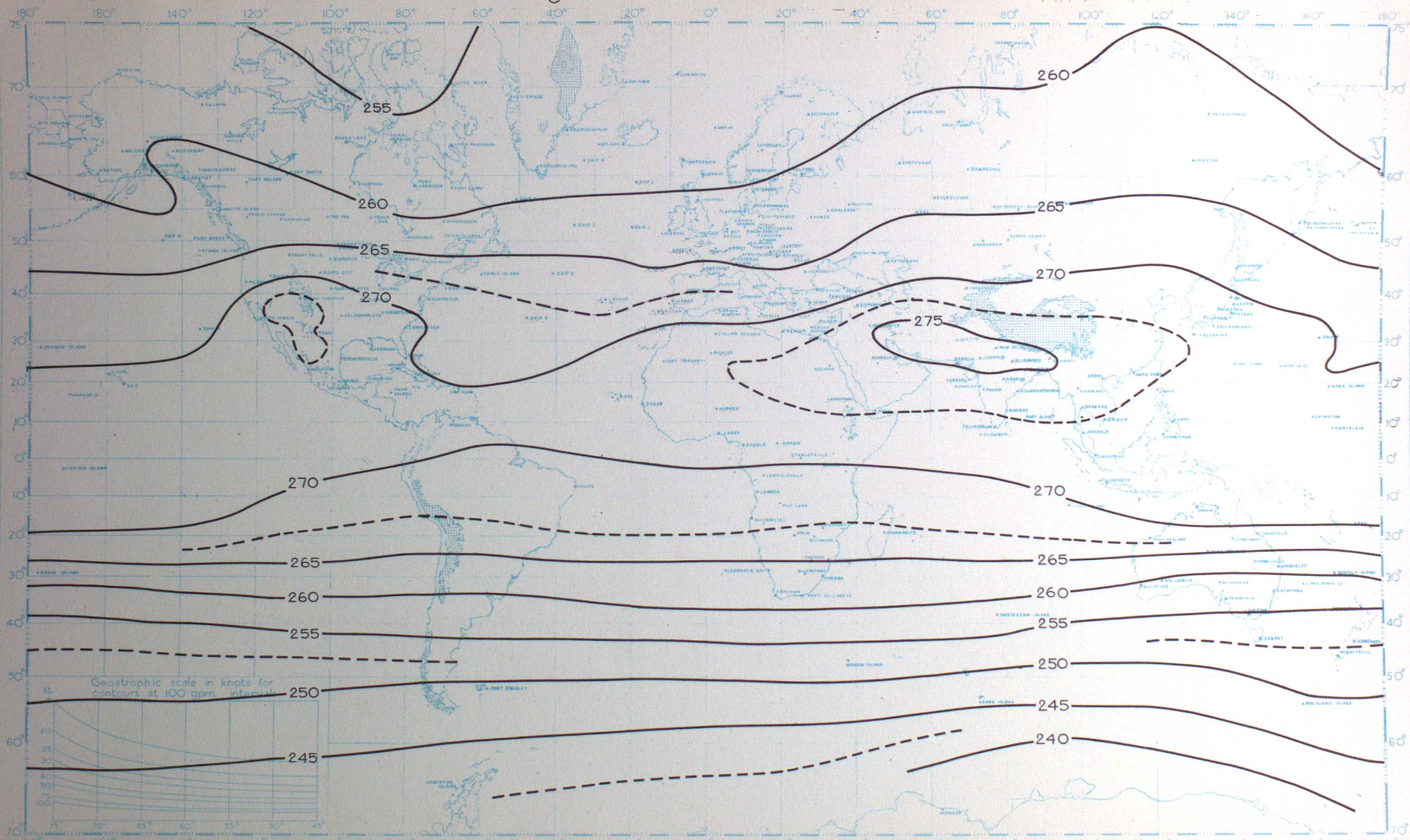


M.O. 13

M.R.P. 1066

Average 700-500mb. Thickness

JULY 1949-53

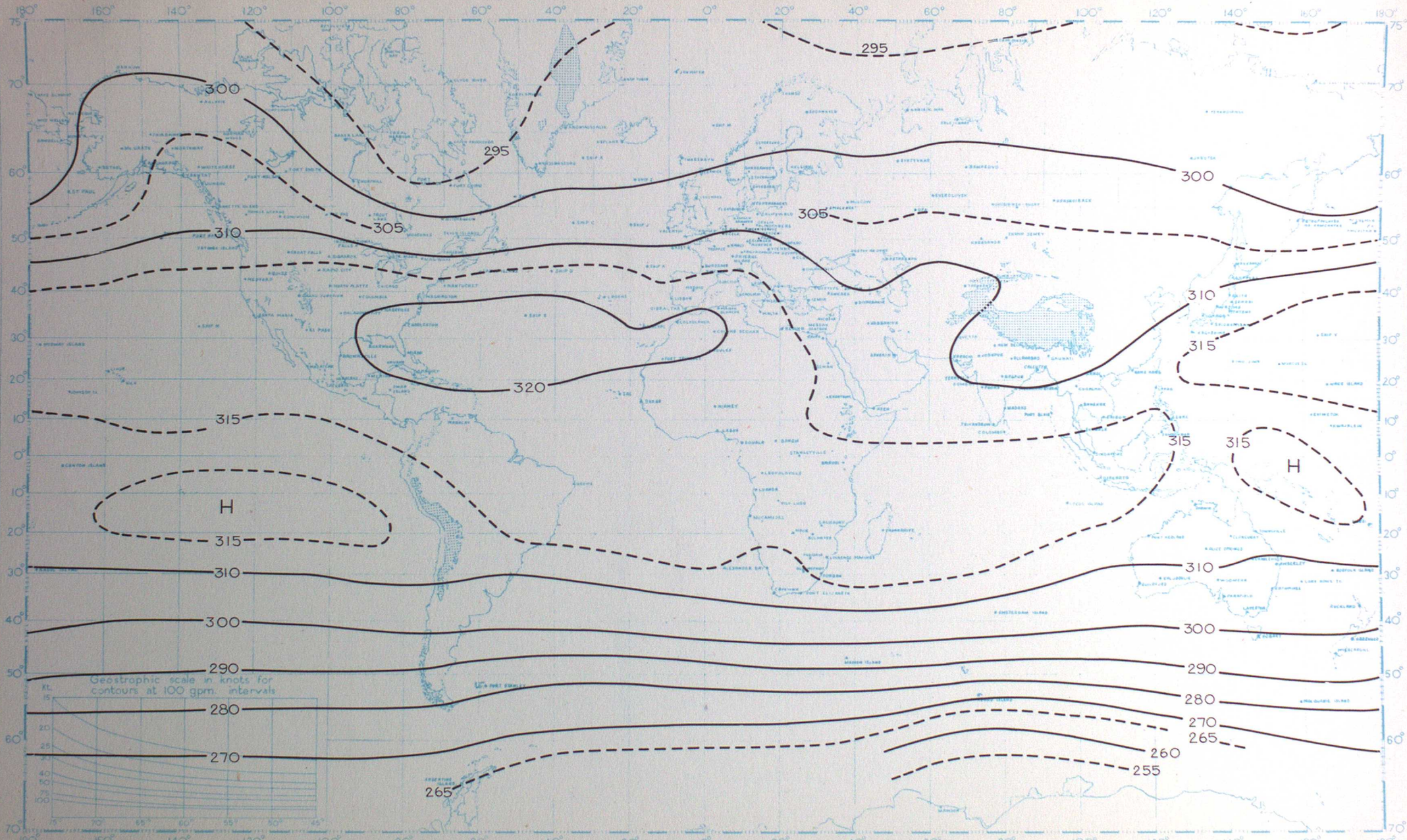


M.O. 13

M.R.P. 1066

Average 700 mb. Contour

JULY 1949-53



Height in dekametres

Revised to May 1955

Land over 3,000 metres

M. O 13